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⑭ Film Image editing apparatus.

⑭ A film image editor for editing a plural photographic film images. The editor includes: a scanner (A) for reading images in a predetermined picture size from a developed photographic film; a picture size detecting circuit (B) for detecting a picture size of each of the images according to its density vari-

ation information; an editing interface (C) for editing the image in the detected picture size according to an input operation by an operator; and an output device (D) for outputting the image which is edited by the editing interface.

that detects a picture size of each image from density variation information on each picture area to be read based on image information read by the image information reading means, editing means (C) that edits, according to input from the outside for instructing the edition, a plurality of images decided by both image information read by the image information reading means and picture sizes detected by the picture size detecting means, and output means (D) that outputs images edited by the editing means.

In this case, the image information reading means (A) is preferably one wherein the photographic film and the line sensor both mentioned above are moved relatively in the secondary scanning direction while the line sensor is scanning a developed photographic film in the primary scanning direction, and thereby image information on the photographic film is read by the line sensor.

It is preferable that the picture size detecting means (B) mentioned above comprises a density variation detecting means that detects the pattern of density variation in the predetermined direction on each picture area to be read based on image information read by the image information reading means and a picture size judging means that judges picture size of each image by comparing the pattern of density variation detected by the density variation detecting means with a reference pattern.

It is preferable that the density variation detecting means is one wherein the pattern of density variation in the longitudinal direction on each of non-image recording areas formed to have a predetermined width over and below the oblong size picture area on a full size frame can be detected. Or, the density variation detecting means may be one wherein the pattern of density variation in the longitudinal direction on an area formed to have a predetermined width between two half size picture areas on a full size frame can be detected. When detecting the pattern of density variation on an area with a predetermined width formed as a non-image recording area due to the specific picture size, the density variation detecting means is preferably one wherein a binary coding means that binary-codes image information read by the image information reading means is provided, and the pattern of density variation is detected based on data binary-coded by the binary-coding means.

Further, it is preferable that the editing means (C) is provided with a display means capable of index-displaying plural images decided by both image information read by the image information reading means and picture sizes detected by the picture size detecting means.

It is further preferable that the editing means (C) is provided with a correction image selecting

means that selects the image to be corrected from a plurality of images decided by both image information read by the image information reading means and picture sizes detected by the picture size detecting means, and with a correcting means that corrects the selected image according to input for instructing the correction.

The correcting means in this case may preferably be provided with a color correction area designating means that designates an area where color correction is made on an original image, a target color selecting means that selects a target color from plural target colors established in advance as a target color for color correction, and a color converting means that performs color conversion for images so that the designated area may match the selected target color.

The editing means (C) mentioned above may further be provided with an edition image selecting means that selects images to be edited from plural images decided by both image information read by the image information reading means and picture sizes detected by the picture size detecting means and with a layout editing means that edits the selected images according to the predetermined layout.

In the above constitution, image information on each picture area having a normal picture size is first read from a developed photographic film by the image information reading means (A). Concretely, the developed photographic film is scanned in the primary scanning direction and in the secondary scanning direction by a line sensor, thus image information recorded on a photographic film is read on a two-dimensional basis.

Next, a picture size of each image is detected by the picture size detecting means (B) from density variation information on each picture area to be read based on image information read by the aforementioned image information reading means.

Concretely, the pattern of density variation in the predetermined direction on each picture area to be read is detected based on image information read. Then, the pattern of density variation detected is compared with a reference pattern corresponding to specific pattern of density variation on each picture size, and a picture size of each image is judged based on the results of the aforementioned comparison.

In this case, detection of the pattern of density variation may be made in the longitudinal direction of an area with a predetermined width formed as a non-image recording area outside an oblong size (panorama size, low-aspect-ratio size) area or a half size area on a full size frame. Thus, a full size, an oblong size and a half size may be judged by whether or not the pattern of density variation on the area mentioned above corresponds to the non-

## DETAILED DESCRIPTION OF THE INVENTION

Examples of the invention will be explained as follows.

Fig. 2 is a sketch drawing of a film image editing apparatus.

On the table of image editing apparatus main body 1 including a film reading device, there are provided cassette inlet 2 for film reading and touch panel (LCD) 3 of a liquid crystal type for operation. Further, there are provided first CRT 4 for indicating input images and second CRT 5 for indicating output images on a side by side basis. Printer 7 provided with scanner 6 for reading reflection type originals can be connected to the image editing apparatus main body 1.

Fig. 3 is a structural drawing of a film reading unit portion.

In this example, developed photographic films (negative films) 10 each having 6 frames are held by film holder 12, and film holders 12 in the maximum quantity of 7 are housed in cassette 20. The cassette 20 is inserted into the cassette inlet 2.

The film holder 12 is provided with lower frame 13 and upper frame 15 affixed through shaft 14 in the hinge type as shown in Fig. 4, and photographic film 10 is sandwiched between the lower frame 13 and the upper frame 15 to be held. On the lower frame 13 and the upper frame 15, there are naturally formed apertures 16 equivalent in quantity to the number of frames (6 frames).

Cassette 20 is a case whose front side is open and 7 steps of holding grooves 21 are formed on each of both sides of the cassette, and film holders 12 in quantity of the maximum 7 can be held in the cassette with their both ends guided by holding grooves 21 at both sides of the cassette in the state that film surfaces are in parallel with each other. Each film holder in the cassette can be drawn out in the direction of the film surface.

Incidentally, in the example, film holders 12 for negative films are housed in cassette 20, and 6 frames x 7 holders, the maximum 42 frames in total can be housed in the cassette. On the other hand, when using a film holder for a positive film capable of holding 5 sheets of positive films each being a frame, 5 frames x 7 holders, the maximum 35 frames in total can be housed. Film holders for a negative film and those for a positive film can naturally be housed mixedly.

In order for an arbitrary film holder 12 to be picked out of cassette 20 in cassette receiver 22 communicating with cassette inlet 2 and transported to a reading position, there are provided film holder transport devices 23 and 23 on both sides of the cassette receiver 22.

The film holder transport devices 23 are moved up or down by an elevating mechanism to the

position where the film holder 12 to be transported is housed so that holding arms 24 thereon may hold the film holder 12, and then, the film holder transport devices are further moved back or forth by a sliding mechanism so that the film holder held by the holding arms 24 may be transported onto secondary scanning table 25.

The secondary scanning table 25 is one on which film holder 12 transported by film holder transport devices 23 is placed, and it is provided with aperture 26 which faces a frame on a film. The secondary scanning table 25 is reciprocated by belt 30 driven by a stepping motor that is housed in driving unit 29 while being guided by two guide rails 27 and 28 extending in the direction perpendicular to the transporting direction of the film holder transport devices 23.

Under the secondary scanning table 25, there are provided lamp 31, converging mirror 32 and condenser lens 33 so that light emitted from the lamp 31 may be converged by the converging mirror 32 and condenser lens 33 to illuminate photographic film 10 held by the film holder 12.

On an optical path of light passing through the photographic film 10 over the secondary scanning table 25, there is provided CCD line sensor 35 for color use through reading lens system (including a diaphragm and a filter) 34. The CCD line sensor 35 is one wherein a large number of pixels (photoelectric conversion elements) are arranged in the direction (primary scanning direction) perpendicular to the reciprocating direction (secondary scanning direction) of the secondary scanning table 25.

With regard to reading operation, after cassette 20 wherein film holder 12 is housed is set on cassette inlet 2, designated film holder 12 is transported by transport device 23 onto secondary scanning table 25 from the cassette 20.

After this, the secondary scanning table 25 is moved by driving unit 29 so that signals of the CCD line sensor 35 may be read while the film holder 12 is moving, thus image information on all frames in the film holder 12 or image information of the designated frame can be obtained.

In this case, an unillustrated origin mark is provided on the secondary scanning table 25, and when the origin mark is detected by an affixed unillustrated photosensor, the original position can be detected. When reading corresponding to an amount of driving (an amount of rotation of a stepping motor) of the driving unit 29 from the original position, each frame, namely each picture area having an ordinary picture size (full size) can be read in succession.

After completion of reading, the driving unit 29 moves reversely the secondary scanning table 25 to return it to its initial position. Thereby, the film holder 12 on the secondary scanning table 25 is

aspect-ratio size) which is oblong compared with a full size is formed by narrowing the full size picture area vertically with upper and lower non-image recording portions (light-shielded portions) each having a predetermined width. A half size is formed by dividing a full size picture area into two equal image-recording areas with a non-image recording portion having a predetermined width extending vertically (transverse direction of the film) on the central portion of the full size picture area.

Therefore, if non-image recording portions (light-shielded portions) within a full size picture area can be distinguished based on image signals which have been read as a full size picture area, it is possible to distinguish a full size, a panorama size and a half size.

For example, there is detected density (transmissivity) variation in the longitudinal direction (secondary scanning direction in the present example, being in accord with the film frame feeding direction) within each of lower and upper portions which are non-image recording portions for a panorama size assumed respectively as judgment area  $t_1$  and judgment area  $t_2$  (see Fig. 8).

In this case, when the read picture size is a panorama size, base density (minimum density) showing the maximum transmissivity is fixed without being changed (see Fig. 9 (a)) because the aforementioned judgment areas  $t_1$  and  $t_2$  are non-image recording portions. When the read picture size is a full size, density changes at random at the level higher than base density (transmissivity lower than the maximum transmissivity) because images are recorded on the judgment areas  $t_1$  and  $t_2$  (see Fig. 9 (c)), while when the read picture size is a half size, the central portion shows the maximum transmissivity corresponding to base density (minimum density) because a non-image recording portion exists at the center in terms of the direction of detecting density variation (see Fig. 9 (b)).

A non-image recording portion between two half size picture areas on a full size picture area is assumed as judgment area  $u\phi$  (see Fig. 8), and density variation in the longitudinal direction (primary scanning direction in the present example and is in accord with the transverse direction of the film) on the judgment area  $u\phi$  is detected.

In this case, when the picture size is a panorama size, a non-image recording portion having a predetermined width exists at each of starting and ending sides in the density detecting direction. Therefore, each of starting side and ending side shows the maximum transmissivity (minimum density) corresponding to each non-image recording portion having a predetermined width, and an in-between portion shows relatively high density corresponding to image recording (see Fig. 10 (a)). When the picture size is a half size, on the other

hand, the judgment area  $u\phi$  mentioned above agrees with a non-image recording portion. Therefore, base density (minimum density) showing the maximum transmissivity is fixed (see Fig. 10 (b)). Further, when the picture size is a full size, the portion from the starting point to the ending point is an image recording area. Therefore, density is kept to be higher than the minimum density (see Fig. 10 (c)).

As stated above, a non-image recording portion (light-shielded portion) formed by a panorama size or by a half size on a full size picture area is specified as a judgment area, and the pattern of density variation in the longitudinal direction on the judgment area is detected. Thus, picture sizes (a full size, a panorama size and a half size) can be detected based on image signals read as a full size picture area, by judging agreement between the detected pattern and the pattern specific to each picture area (reference pattern)

According to the basic characteristics mentioned above, CPU 43 detects picture sizes based on digital image signals stored in memory 47. However, the digital image signals stored in the memory 47 are made to be rough scanning data for 8 times greater speed because they are the data used only for detection of picture sizes.

Further, the memory 47 may also be arranged so that image signals on the entire portion on a full size picture area may be stored in the memory 47. However, what is needed for detection of picture sizes is only an image signal of a judgment area that is a non-image recording portion (light-shielded portion) formed by a panorama size or by a half size on a full size picture area. Therefore, CPU 43 is arranged to be capable of giving instruction to control circuit 44 either for storing all areas in the memory 47 (full reading mode) or for storing only image signals of the aforementioned judgment area in the memory 47 (partial reading mode). Therefore, the control circuit 44 can output writing clocks shown in Fig. 11 or Fig. 12 to the memory 47 according to the instruction concerning storage area from the CPU 43.

Next, contents of processing for detection of picture sizes in CPU 43 will be explained as follows, referring to flow charts shown in Fig. 13 and Fig. 14. These flow charts in Figs. 13 and 14 correspond to picture size detecting means.

A flow chart in Fig. 13 shows a total flow of detection of picture sizes.

In step 1 (shown as S1 in the figure; which applies also to the following cases), the control circuit 44 is set to a mode of 8 times greater speed.

Then, in step 2, discrimination is made for whether a full image reading mode is selected or a partial reading mode is selected. Depending on the

advances to step 19 wherein when the pattern of density variation on the lower judgment area  $t_1$  represents a pattern wherein the pattern showing that the most area is a non-image recording area and only a part thereof is an image recording area as shown in Fig. 18 (a) appears although the density variation in the secondary scanning direction (longitudinal direction in a judgment area) for the upper judgment area  $t_2$  agrees with the pattern (Fig. 15 (a)) of a panorama size, a portion representing the aforementioned image recording is estimated to be a noise caused by printing of a date or the like, and the sequence advances to step 20 for further confirmation.

In step 20, a pattern of density variation in the longitudinal direction (that agrees with the primary scanning direction) on judgment area  $u\phi$  which is a non-image recording area extended vertically at the center of a picture area in the case of a half size is detected, and then discrimination is made whether or not the detected pattern agrees with a reference pattern of a panorama size with which upper and lower non-image recording areas shown in Fig. 19 (a) are formed.

In this case, when the judgment area  $u\phi$  extending vertically at the center of a picture area shows the pattern of density variation specific to a panorama size shown in Fig. 19 (a), the estimation for the occurrence of the noise mentioned above is assumed to be correct, and the sequence advances to step 14 to specify the picture size to be a panorama size.

On the other hand, in steps 19 and 20, when the picture size is confirmed not to be a panorama size even when printing of a date is taken into consideration, the sequence advances to step 21 for processing under the condition of unknown picture size. Incidentally, when the picture size is unknown, it is also possible to process under the condition that all picture sizes are a full size.

Incidentally, a portion of step 14 in Fig. 14 corresponds to a means for detecting density variation, a portion of step 12 corresponds to a means for binary-coding, and a portion of steps 13 - 21 corresponds to a means for judging picture sizes.

In detection of picture sizes shown in a flow chart in Fig. 14, there are used judgment areas  $t_1$ ,  $t_2$  and judgment area  $u\phi$ , however, either judgment areas  $t_1$  and  $t_2$  or judgment area  $u\phi$  only may also be used as a judgment area.

Next, a flow of an editing work in the present film image editing apparatus will be explained as follows, referring to the flow charts in Figs. 20 - 24 and display examples in Figs. 25 - 31. In Figs. 25 - 31, the section of "LCD" shows an image area of touch-panel 3 of a liquid crystal type, the section of "CRT1" shows an image area of first CRT4, and the section of "CRT2" shows an image area of

second CRT5.

Fig. 20 is a flow chart showing the total flow of an editing work.

When the film image editing apparatus is started, the image area of the touch panel instructs to insert a cassette, and a start button operated after the insertion of the cassette starts the apparatus to read from the cassette (step 101 in Fig. 20).

In this case, a plurality of film holders 12 in the cassette 20 are transported in succession onto secondary scanning table 25, and all images of all frames from all film holders 12 are read roughly at high speed (rough scanning).

The rough scanning is repeated twice for each film holder 12, and the first half thereof is called pre-scanning, while the second half thereof is called index-scanning. Namely, image data are obtained through the prescanning at 8 times greater speed in the first half of the rough scanning, then, based on the image data thus obtained, correction data are prepared, and after that, image data are obtained through the index scanning at 8 times greater speed in the second half of the rough scanning while correcting with the correction data, and the image data thus obtained are stored in a frame memory.

In the manner mentioned above, images of the frames in the maximum number of 42 (6 frames  $\times$  7 holders) are read and index-displayed on the first CRT as shown in Fig. 25 (step 102 in Fig. 20).

Incidentally, index-display in step 102 in Fig. 20 is performed according to the flow chart in Fig. 21, and picture size of each frame is discriminated (step 201) based on the results of detection of picture sizes mentioned above. When the picture size is a full size, normal display is made for each frame (step 202), when it is a panorama size (low-aspect-ratio size), display is made successively on the space equivalent to two consecutive frames (step 203), and when it is a half size, a frame is divided into two and each divided one is tilted by 90 degrees for display (step 204). After completion of index-display for all frames, the sequence advances to return (step 25).

It is possible to input images also from reflection type originals in addition to photographic films.

After completion of index-display, mode-selection menus for index print (51), album (52), free layout (53), post card (54) and calendar (55) are displayed in icons together with their selection buttons as shown in Fig. 25 so that desired mode may be selected (step 103 in Fig. 20). Incidentally, the following explanation is on the assumption that an album mode is selected.

In the case of an album mode, a format (F.1 - F.8) selection image area is displayed on the touch panel as shown in Fig. 26, for selection.(step 104 → step 105 in Fig. 20).

407, and step 408 → step 409 in Fig. 23). In this case, an original image is indicated on the first CRT, while, an image after correction is indicated on the second CRT.

When the manual color correction button (73) is operated, the mode proceeds to a manual color correction mode (step 410 → step 411 in Fig. 23).

In the manual color correction mode, a manual color correction screen as shown in Fig. 30 is displayed. Namely, a color chart (red, yellow, green, cyan, blue and magenta) of a circular coordinate form is displayed on each of the touch panel and the first CRT. In this case, when touching an appropriate position (for example, 76) on the touch panel, correction direction and correction amount are determined for color correction. Even in this case, an original image is shown on the first CRT and an image after correction is shown on the second CRT. When completion button (77) is operated the screen returns to image correction screen (Fig. 29).

When automatic color correction button (74) is operated on the other hand, a mode is changed to an automatic color correction mode (step 412 → step 413 in Fig. 23).

On the automatic color correction mode, an automatic color correction screen as shown in Fig. 31 is displayed as the concrete contents of step 413 in Fig. 23 are shown on a flow chart in Fig. 24 (step 511 in Fig. 24).

Within the automatic color correction screen, correction area designating button (78) is indicated on a touch panel, and target color selecting button such as, for example, target color selecting buttons (81 - 83) respectively for skin color, gray and blue are indicated according to a plurality of target colors established in advance.

Therefore, it is possible to designate an area for color correction on an original image by operating correction area designating button (78) in the appropriate direction and thereby moving cursor (79) on the first CRT, and it is possible to select target colors through the operation of touching on any of the target color selecting buttons (81 - 83) for skin color, gray and blue, thereby it is possible to change colors by adjusting to the target colors (steps 502, 503 and 504 in Fig. 24).

In this case, a portion of step 502 in Fig. 24 corresponds to a color correction area designating means, a portion of step 503 corresponds to a target color selecting means, and a portion of step 504 corresponds to a color changing means.

In this system, colors which are frequently desired to be used are established in advance as a target color, and a target color of skin color, for example, is selected when desiring to show the color of a human skin, and a target color of blue is selected when desiring to show the color of the

sky. Thus, it is possible to correct colors through a simple operation by designating the portion to be changed to the target color on the screen.

Even in this case, an original image is indicated on the first CRT and the image after correction is indicated on the second CRT. Through an operation of completion button (84), a screen returns to image correction screen (Fig. 29) (step 505 in Fig. 24).

After completion of these image corrections, an operation of completion button (75) brings an image correction mode to an end for returning. (step 414 in Fig. 23).

As stated above, the invention has an effect to make it possible to detect the picture size and to read each image correctly even from a developed photographic film wherein images of different sizes such as a full size, an oblong size (panorama size, low-aspect-ratio size) and a half size are mixed, thereby to edit them.

In addition, with an indicating means that index-displays a plurality of images before editing which is provided, an operator can observe the display, select and edit including correcting. Due to the edition which is done while viewing index-displayed images, the operation is easy and efficient. Thus, it is possible to obtain the results satisfying the intention of an operator.

In addition to the above, an image can be selected from a plurality of images before editing, and the selected image can simply be corrected and edited in terms of layout. With regard to color correction, in particular, correction to colors which are frequently desired to show can be done in a single operation, which means a remarkable improvement in practical use.

## Claims

- 40 1. A film image editing apparatus for editing a plurality of photographic film images, comprising:  
an image reading means for reading an image in a predetermined picture size from a developed photographic film;
- 45 2. The apparatus of claim 1, wherein said image reading means reads said image from a developed photographic film by scanning said developed photographic film with a line sensor
- 50 3. The apparatus of claim 1, wherein said image reading means reads said image from a developed photographic film by reading said image with a line sensor
- 55 4. The apparatus of claim 1, wherein said image reading means reads said image from a developed photographic film by reading said image with a line sensor

FIG. 1

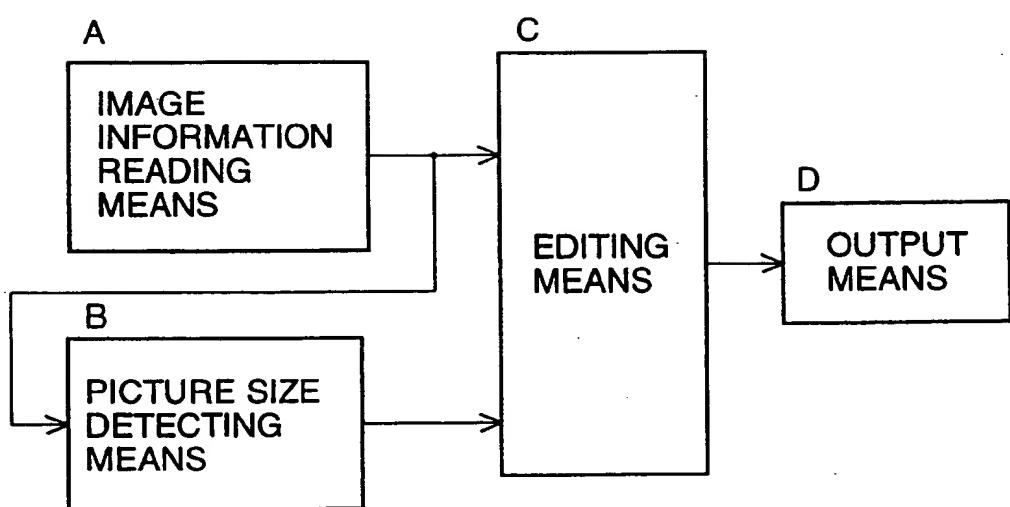


FIG. 3

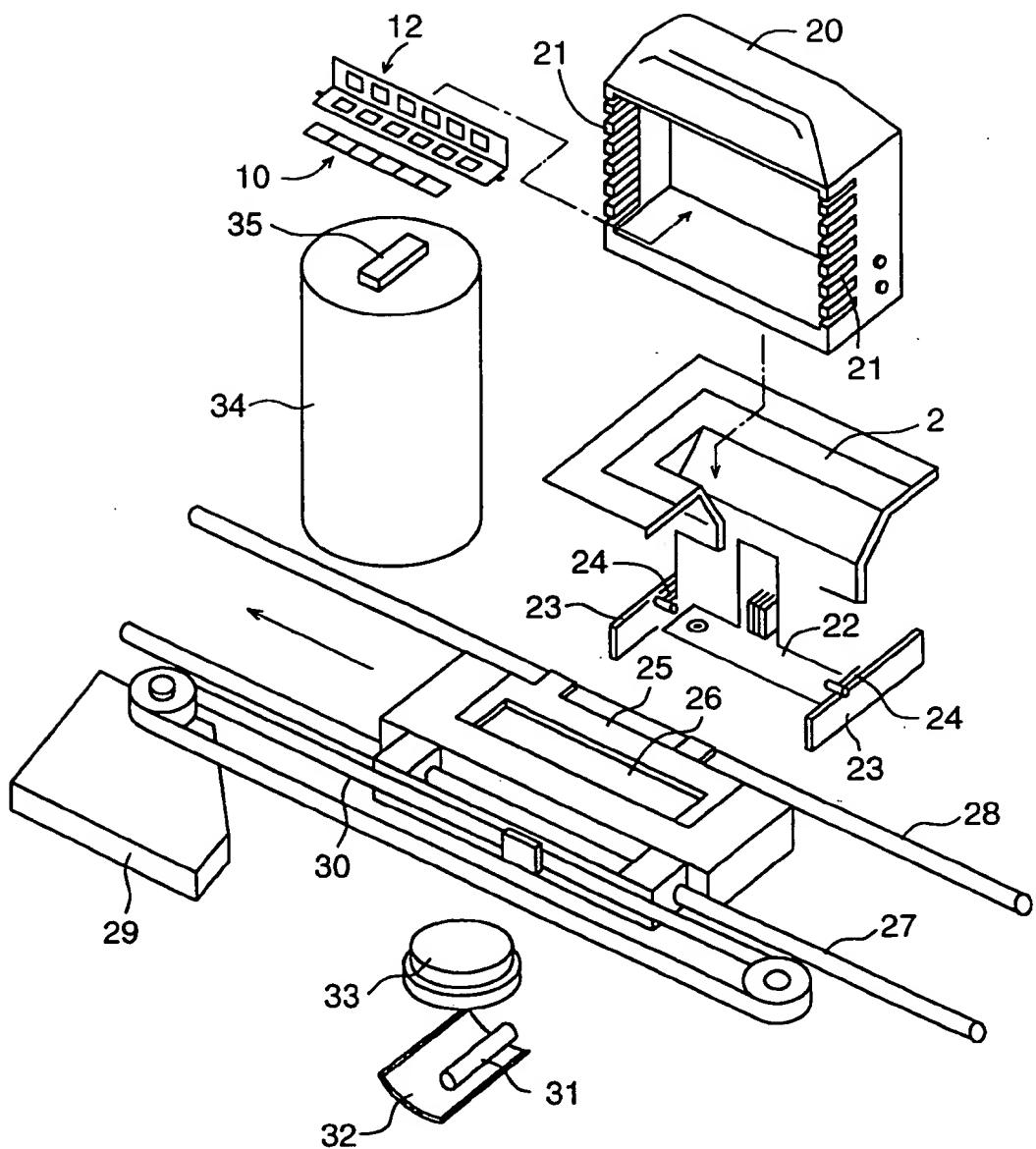


FIG. 5

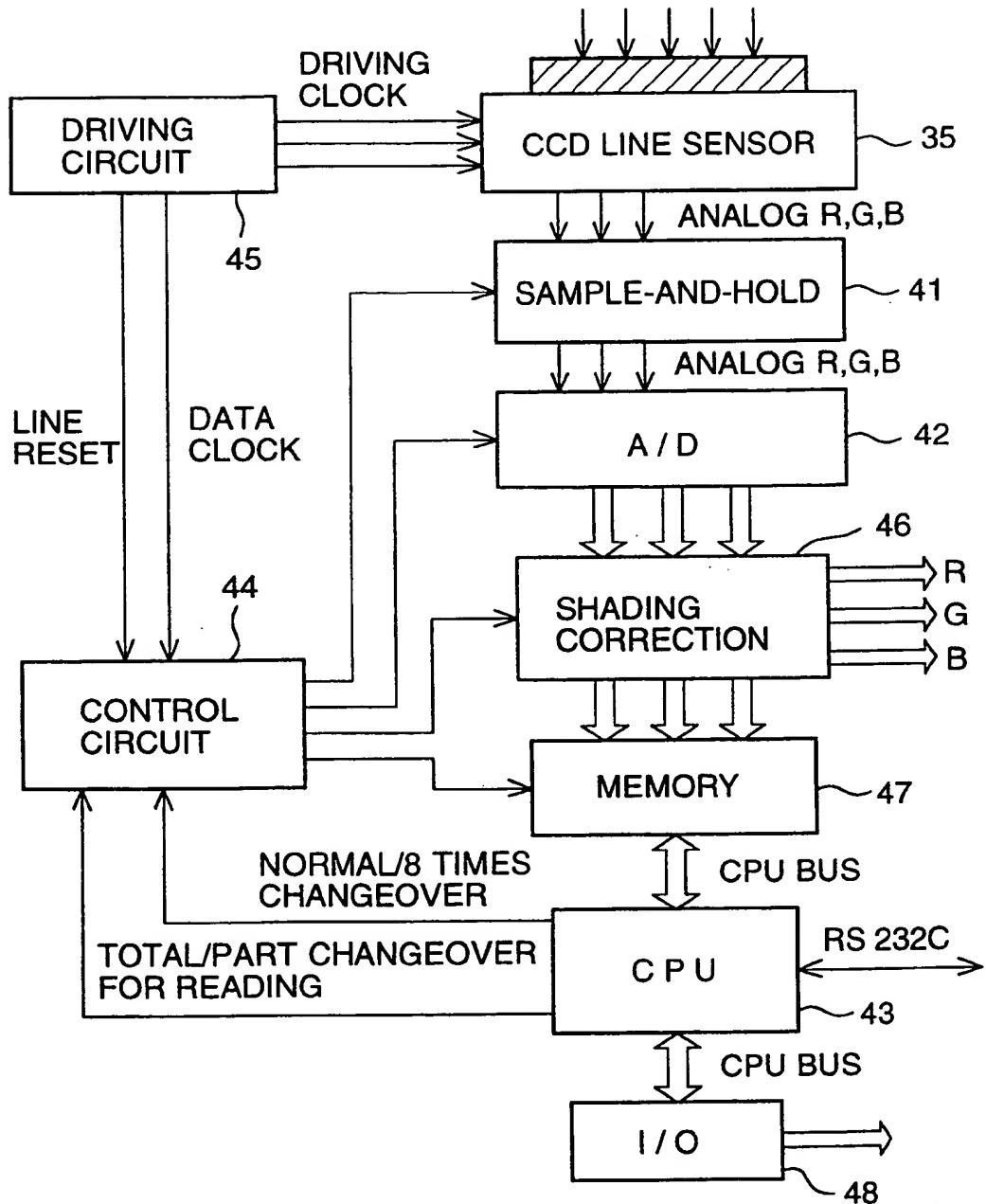


FIG. 7

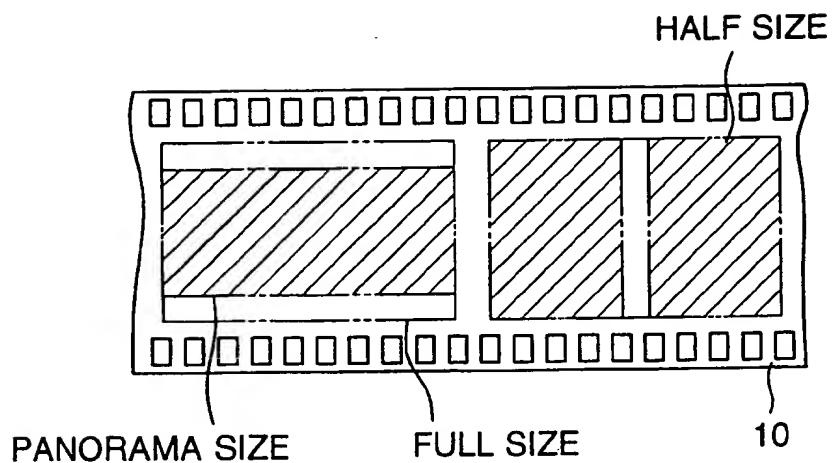


FIG. 8

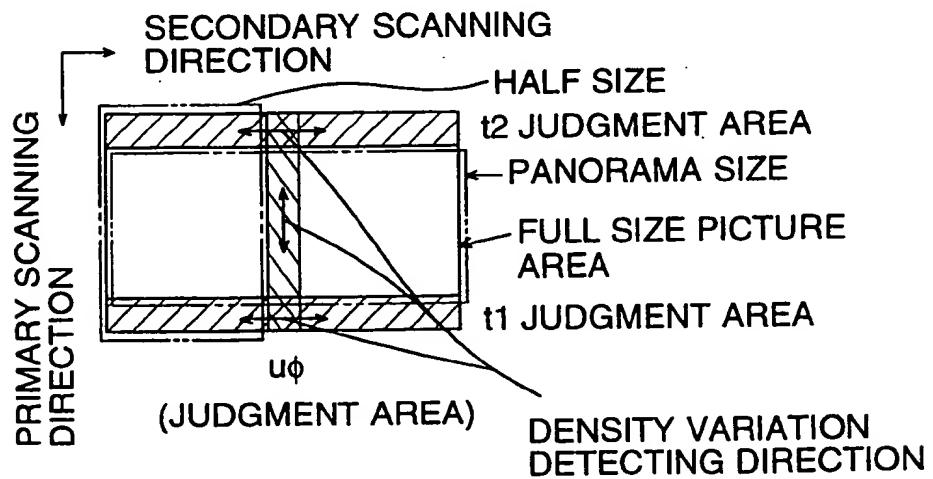


FIG. 10 (a)

PANORAMA  
SIZE

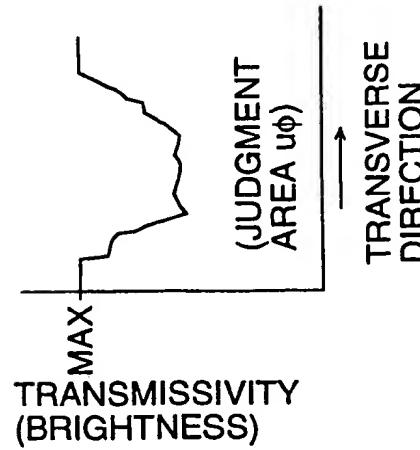


FIG. 10 (b)

HALF SIZE

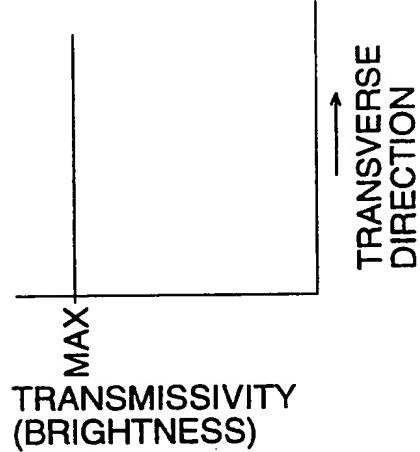


FIG. 10 (c)

FULL SIZE

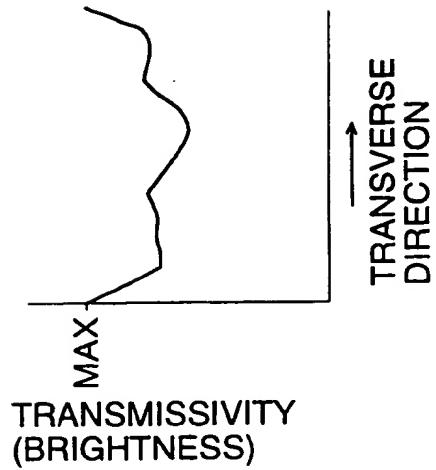


FIG. 12

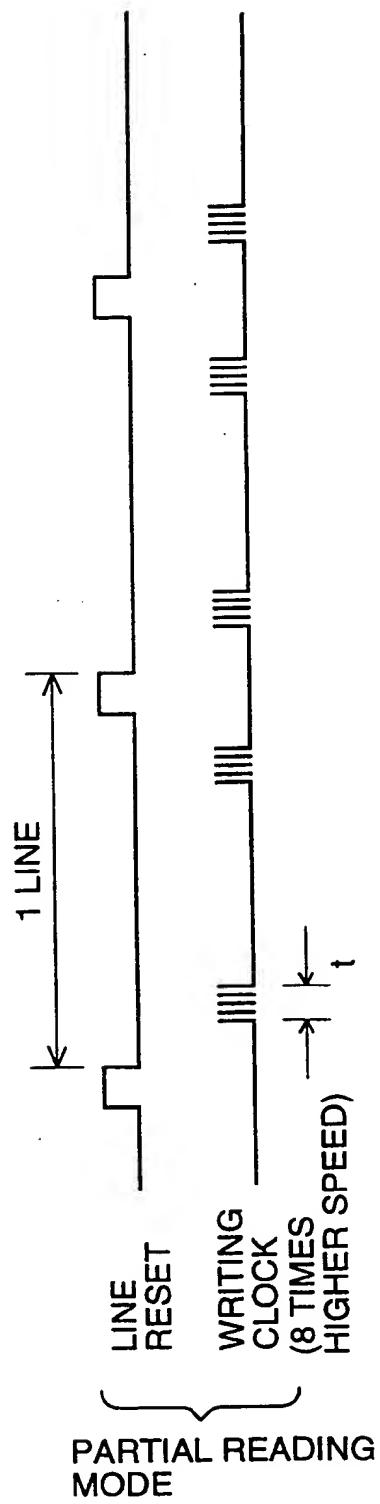


FIG. 14

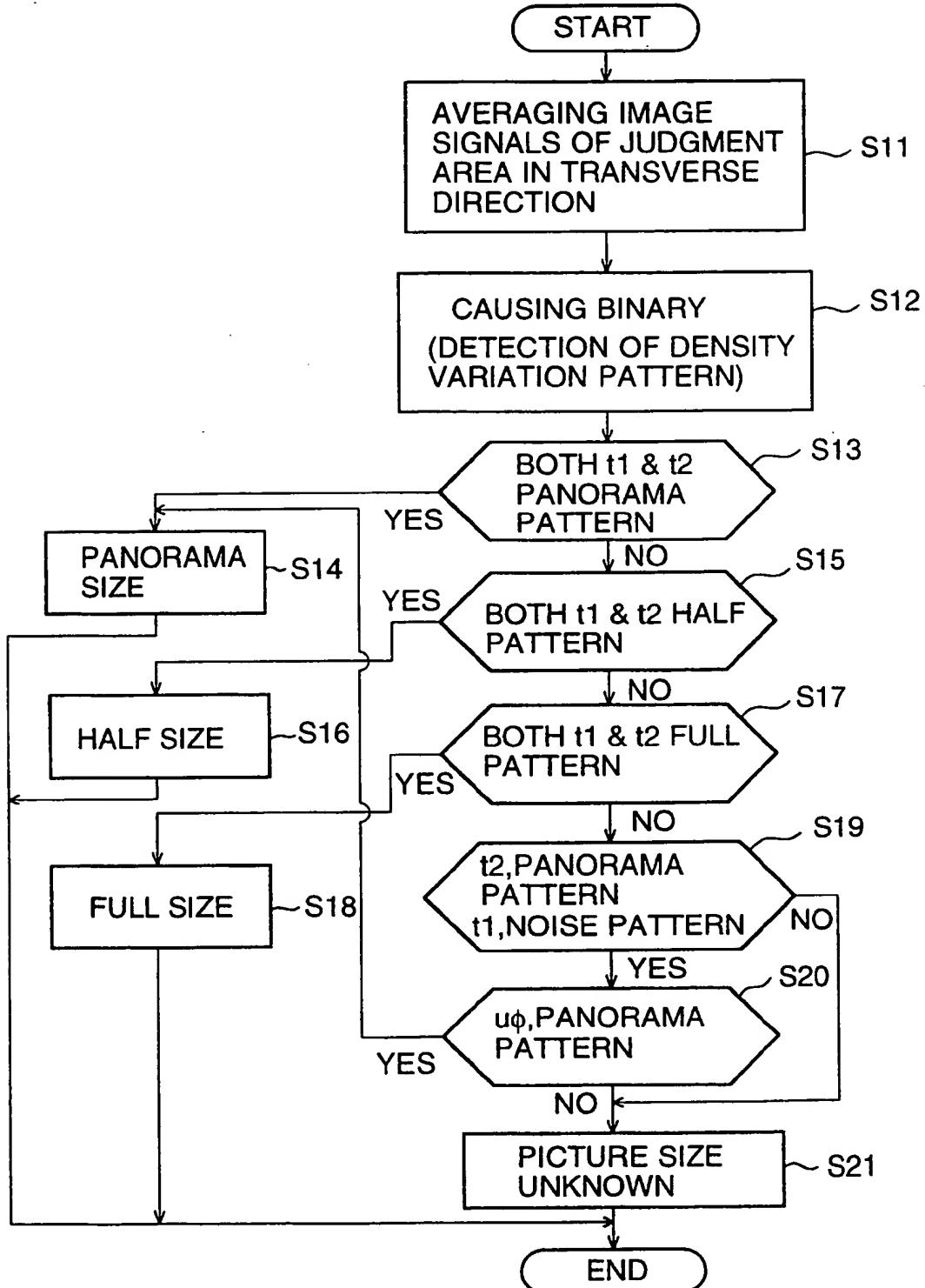


FIG. 18 (a)

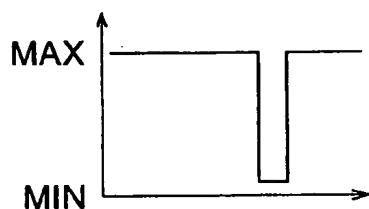


FIG. 18 (b)

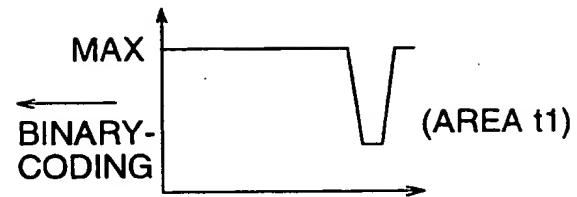


FIG. 19 (a)

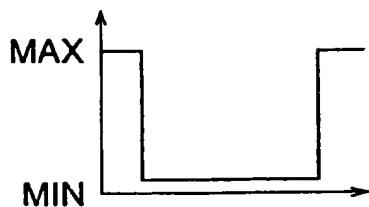


FIG. 19 (b)

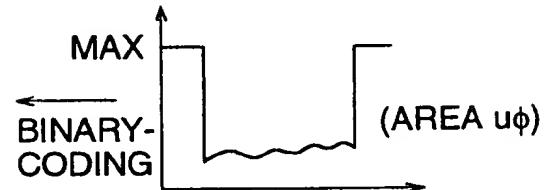


FIG. 21

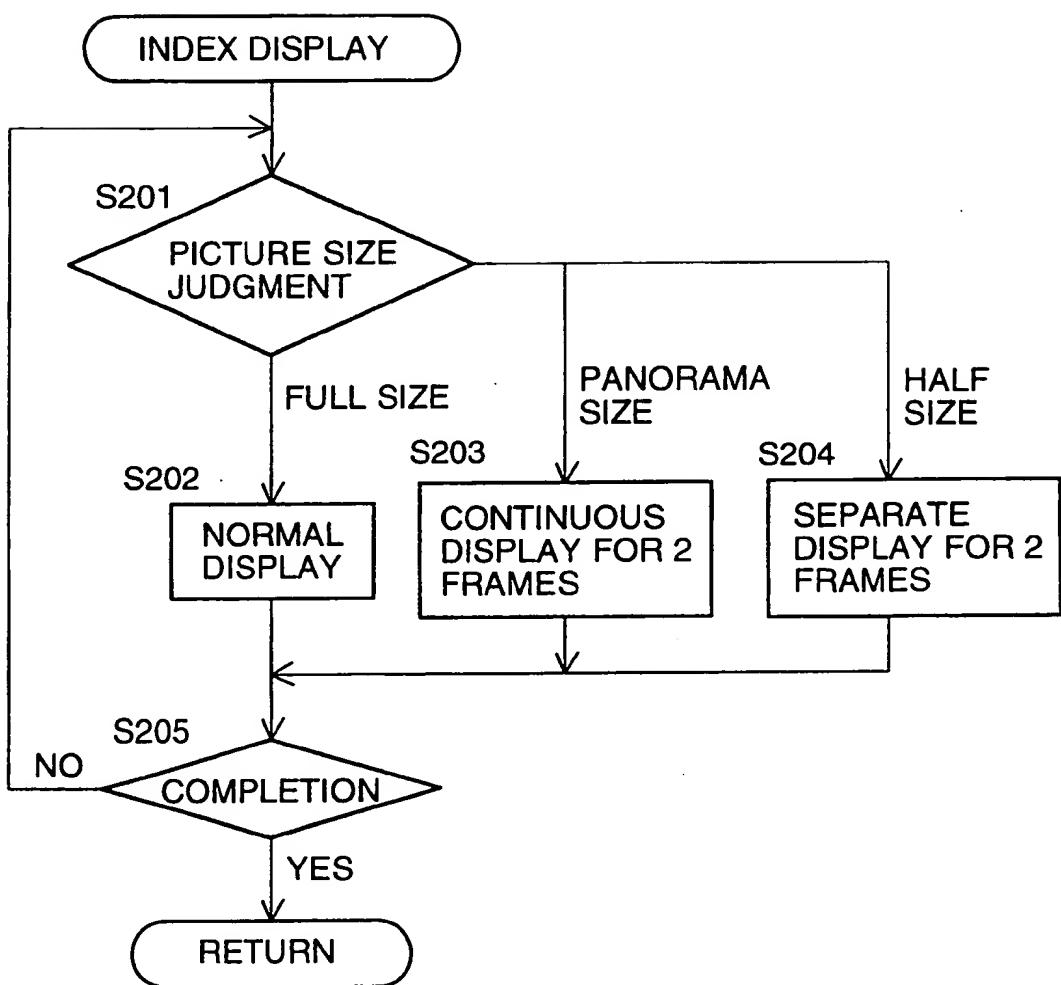
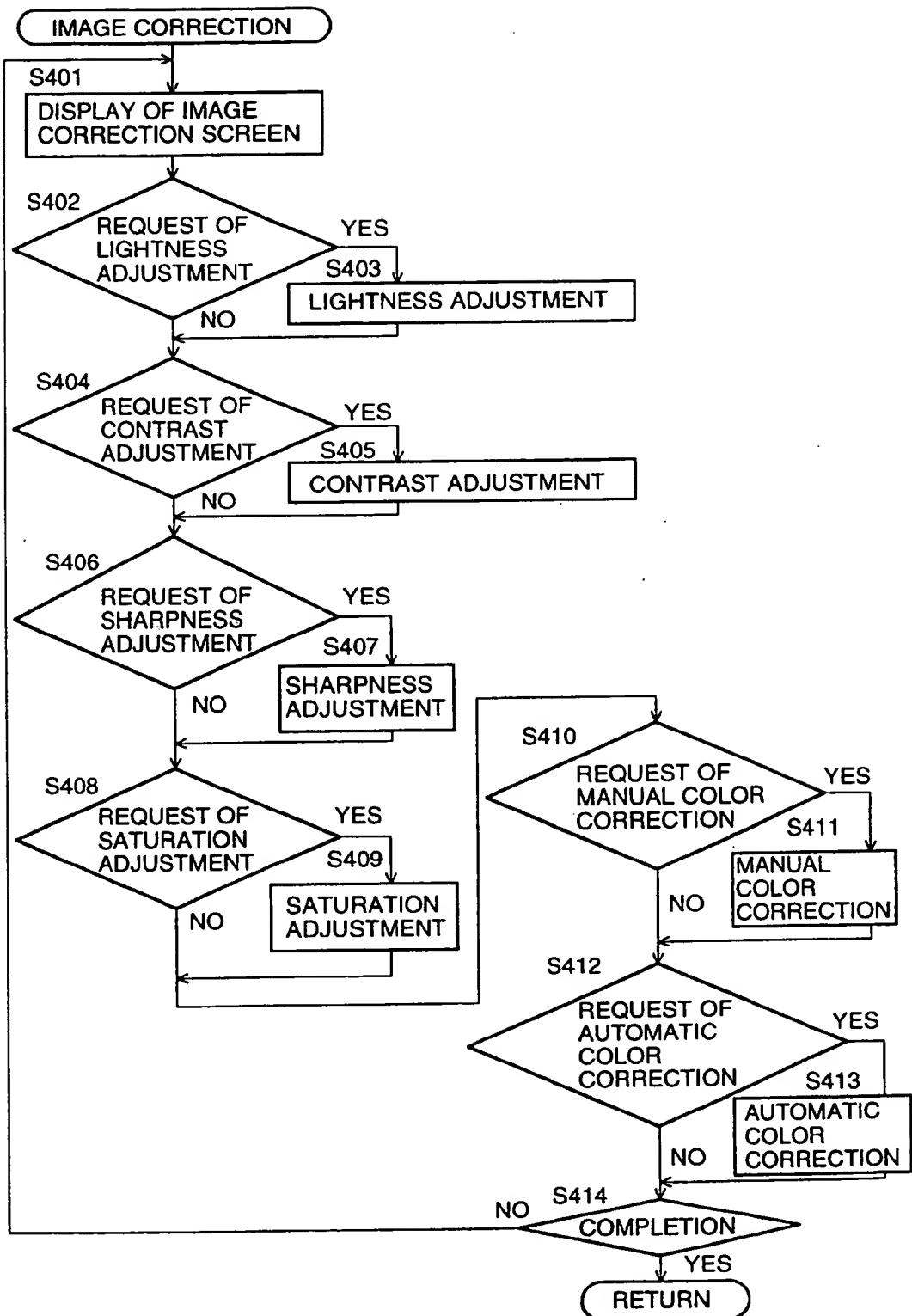


FIG. 23



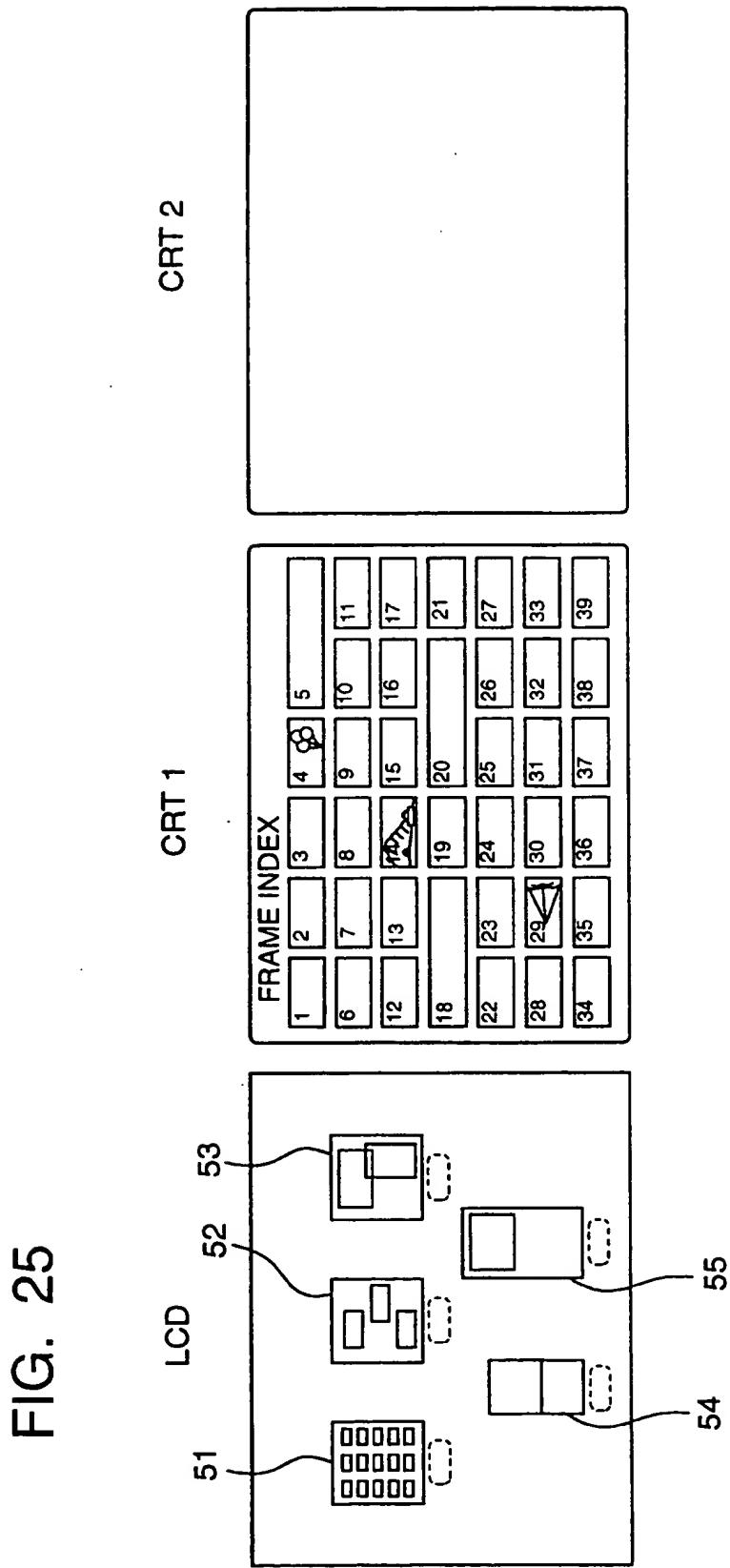


FIG. 27

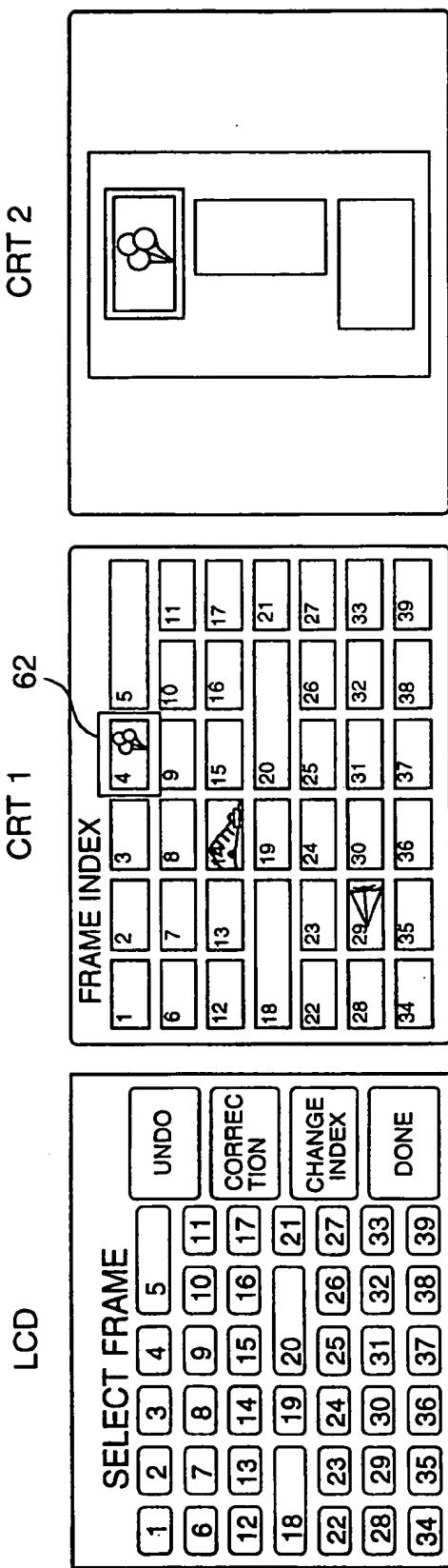


FIG. 29

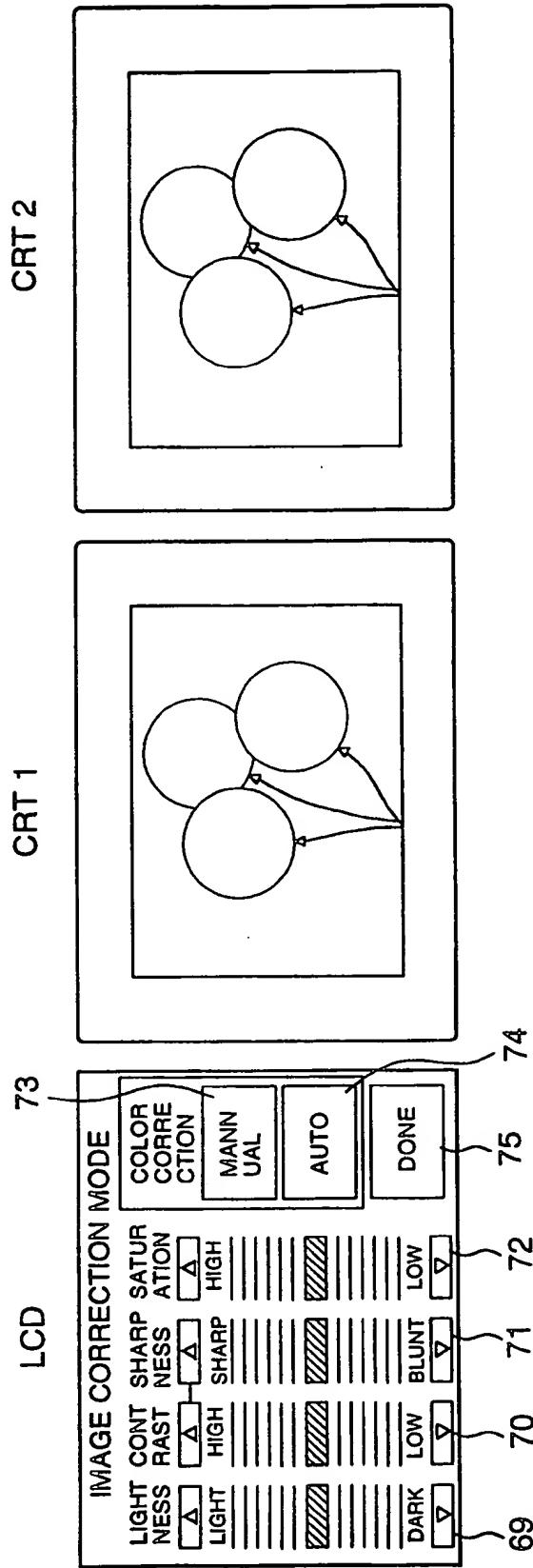


FIG. 31

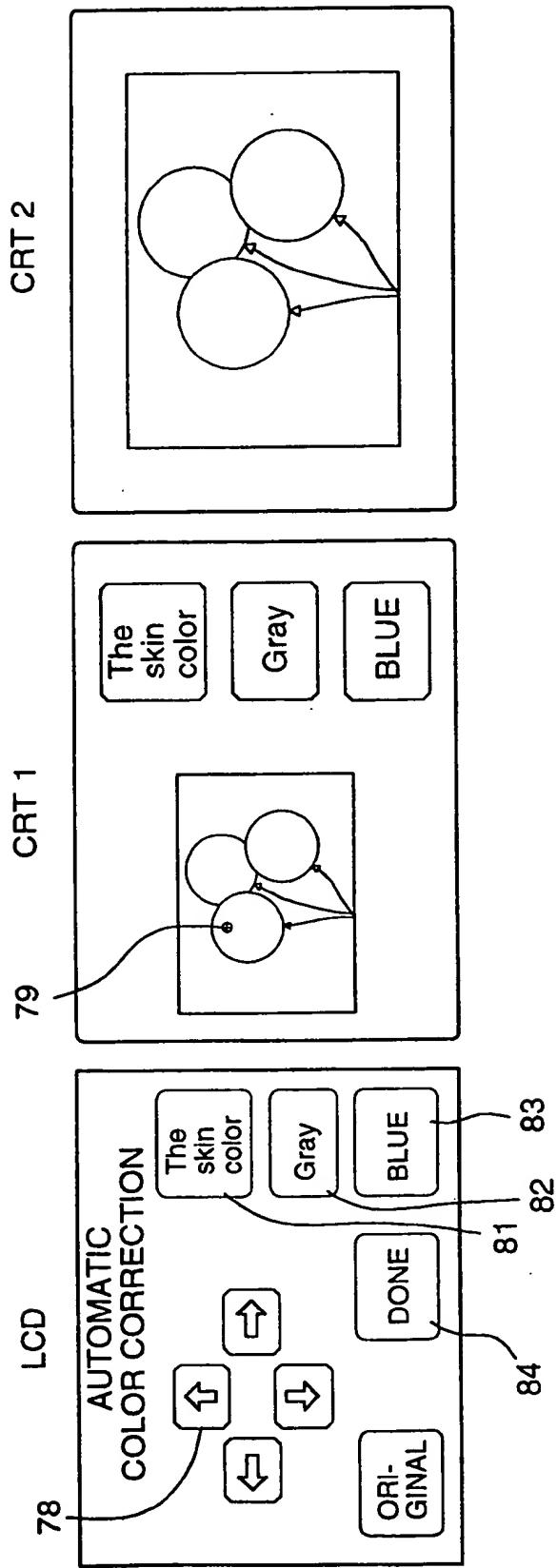


FIG. 1

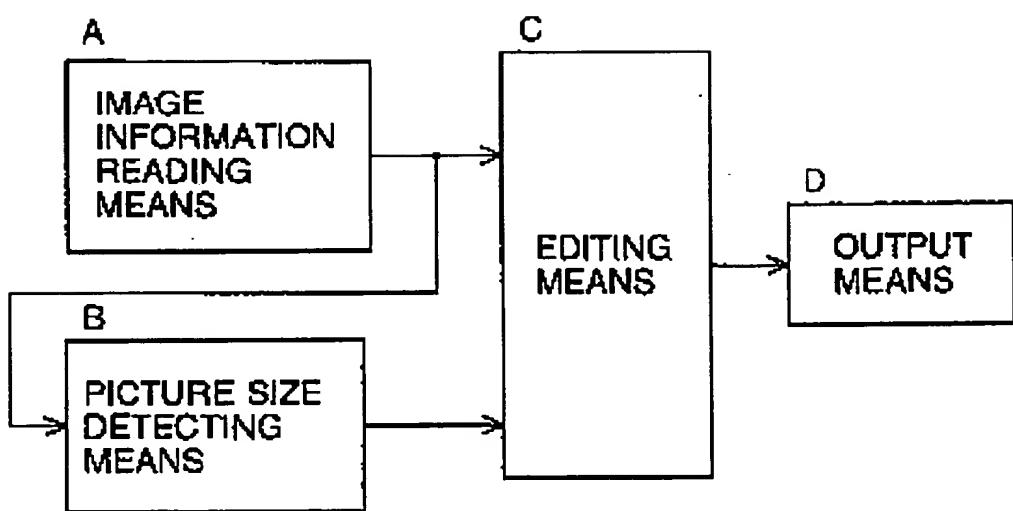


FIG. 3

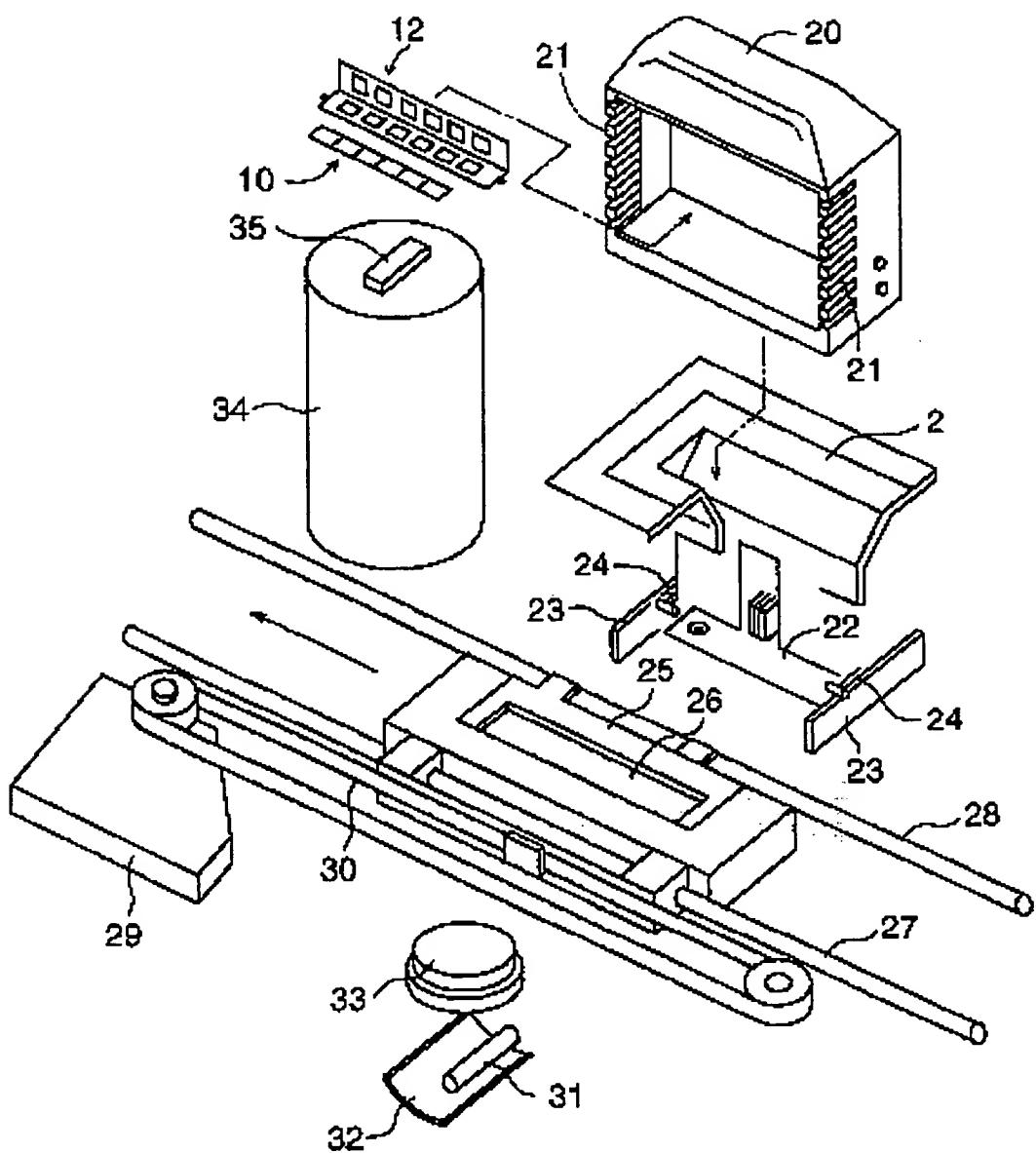


FIG. 5

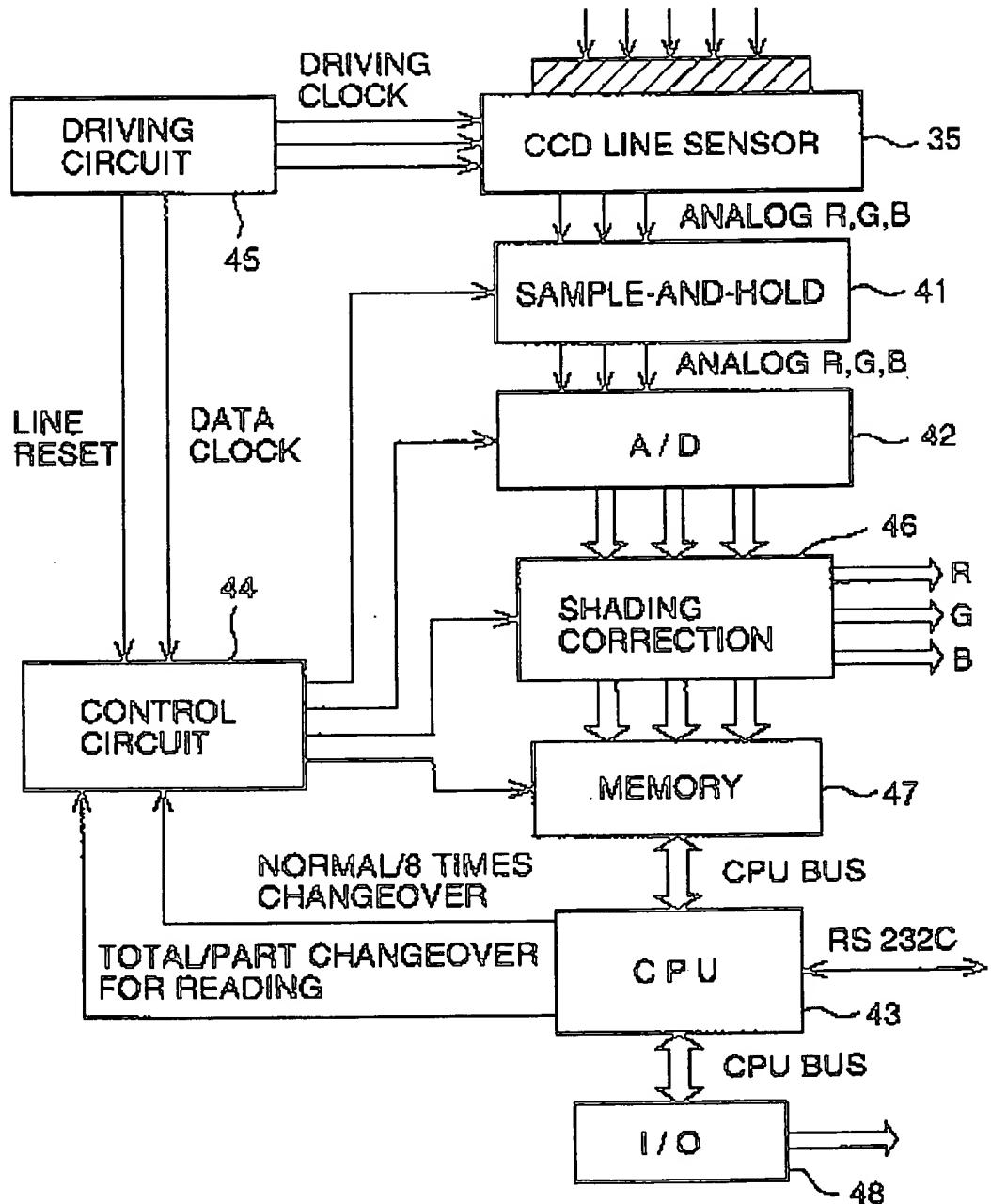


FIG. 7

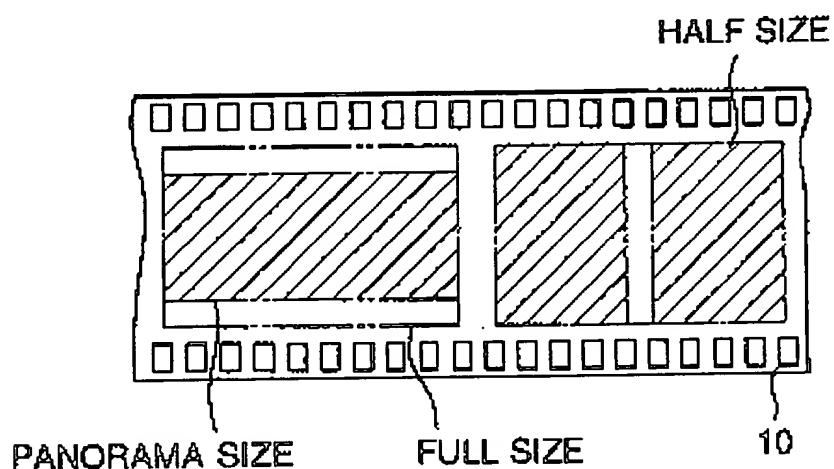


FIG. 8

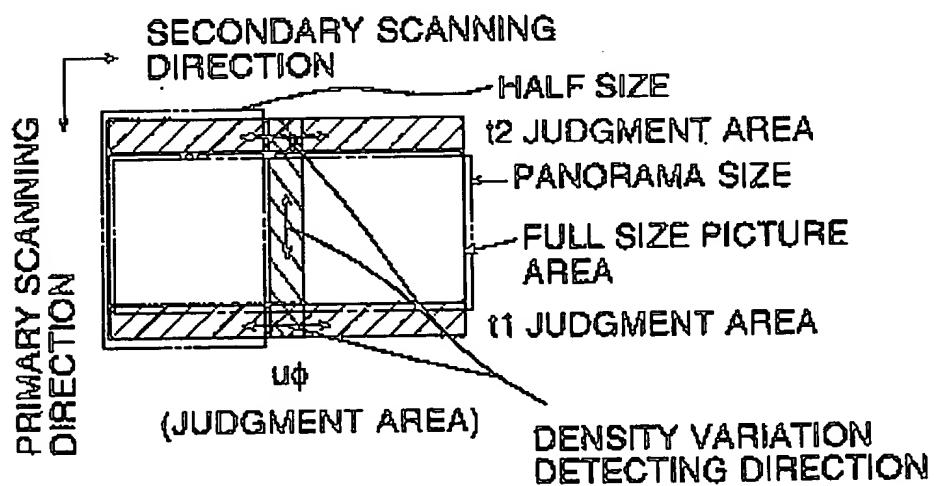


FIG. 10 (a)

PANORAMA  
SIZE

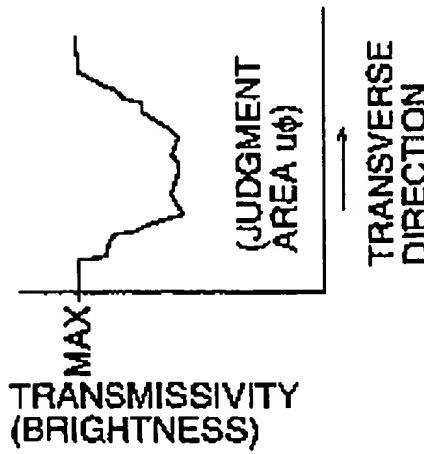


FIG. 10 (b)

HALF SIZE

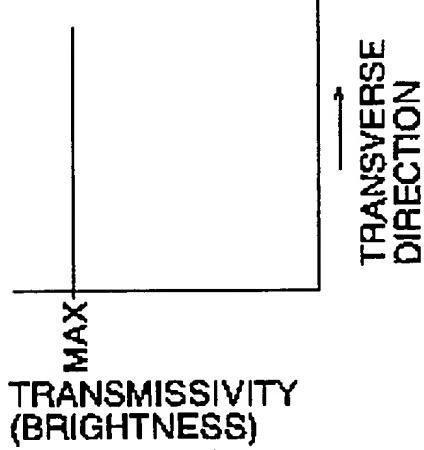


FIG. 10 (c)

FULL SIZE

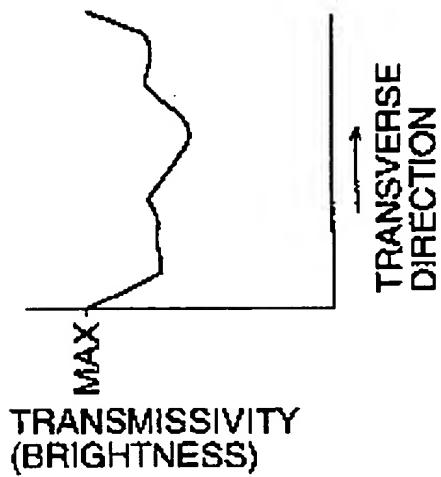


FIG. 12

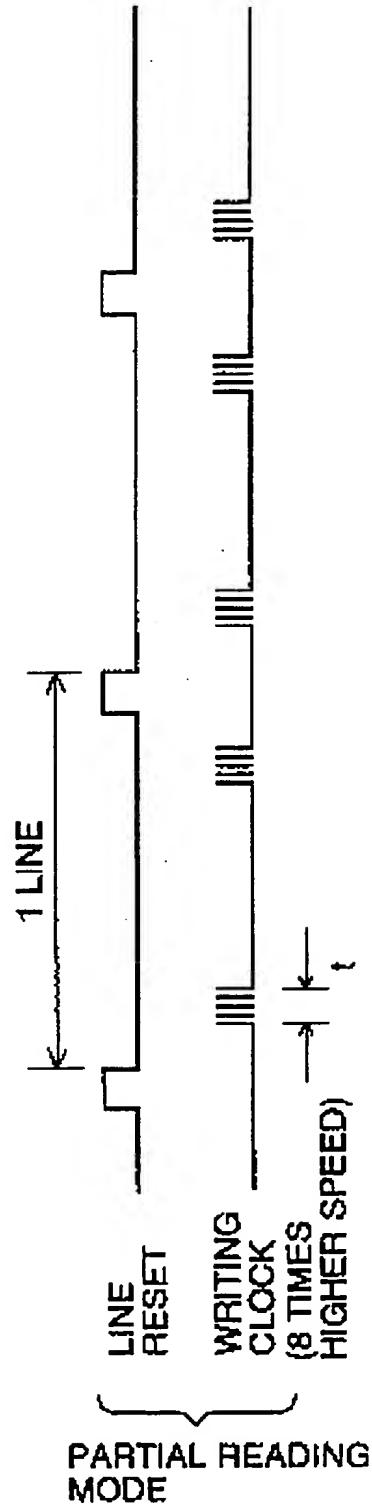


FIG. 14

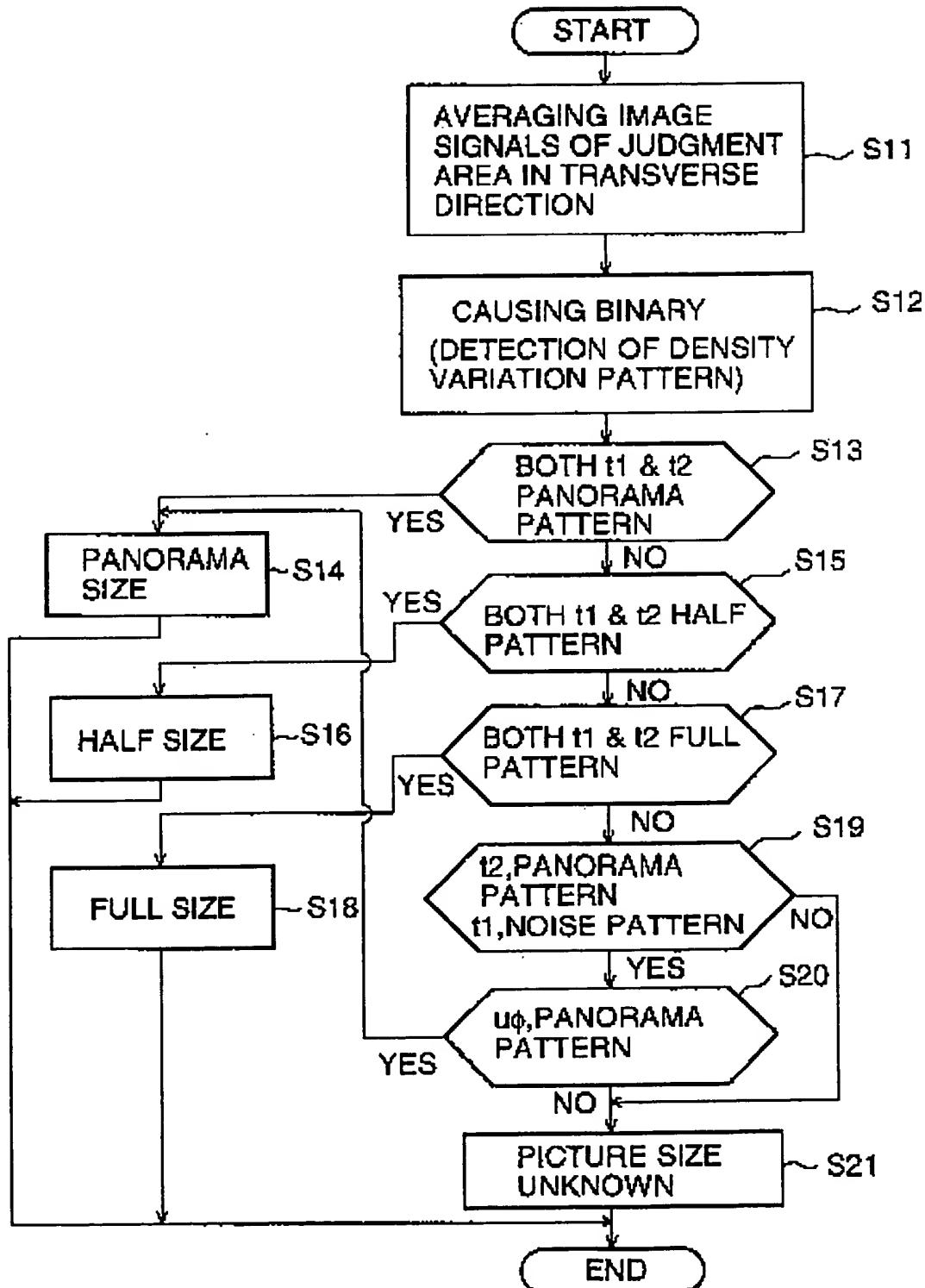


FIG. 18 (a)

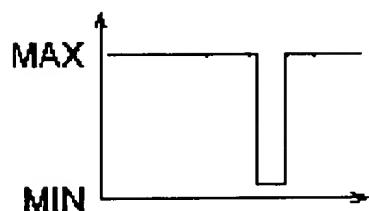


FIG. 18 (b)

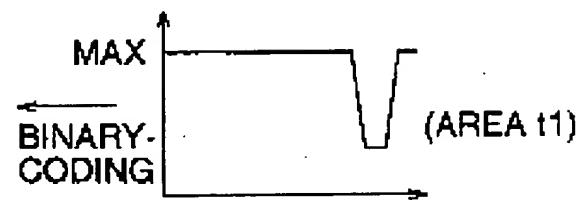


FIG. 19 (a)

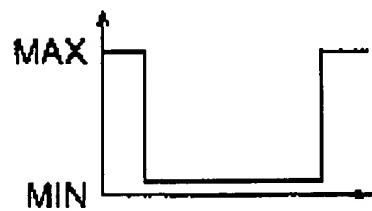


FIG. 19 (b)

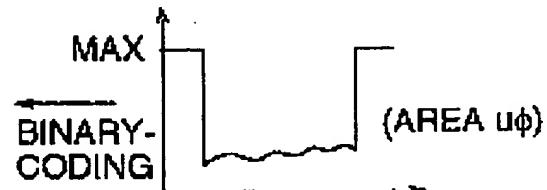


FIG. 21

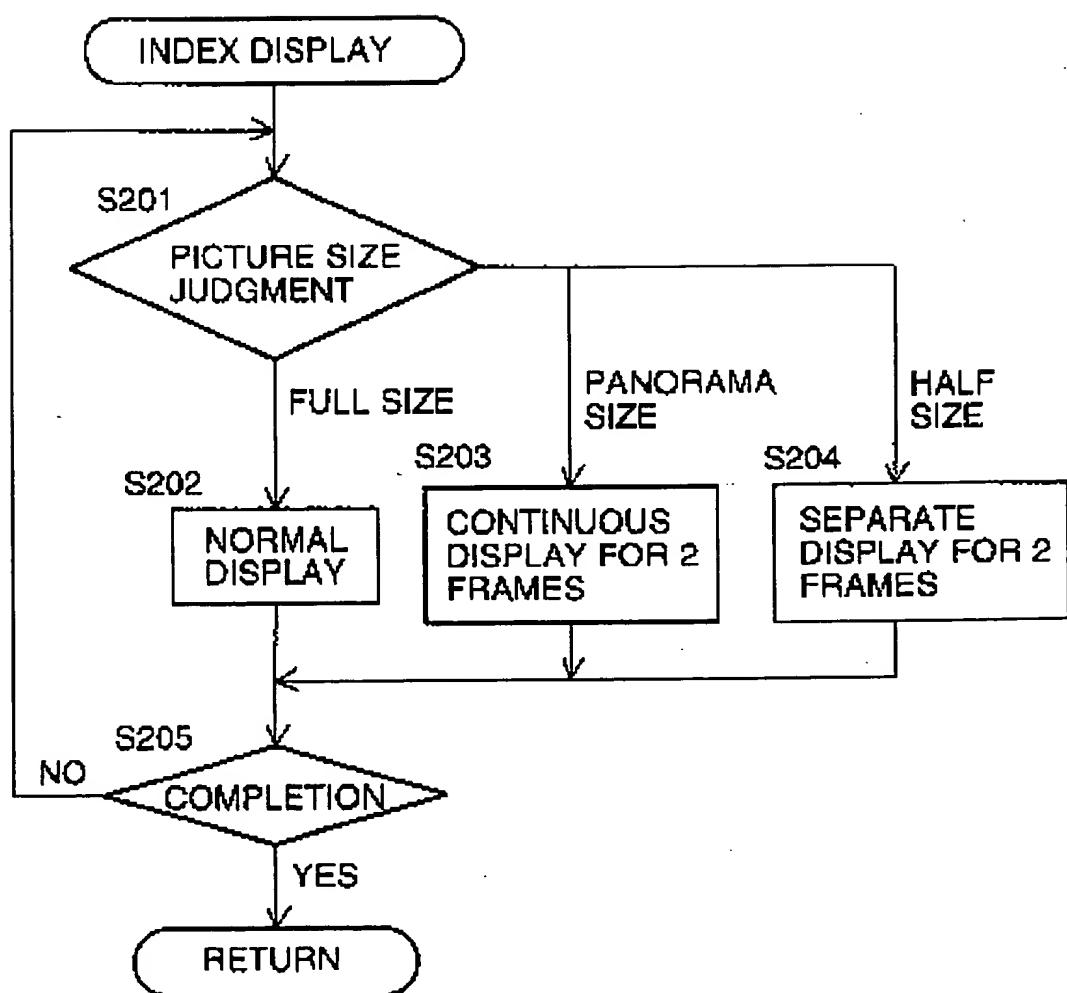


FIG. 23

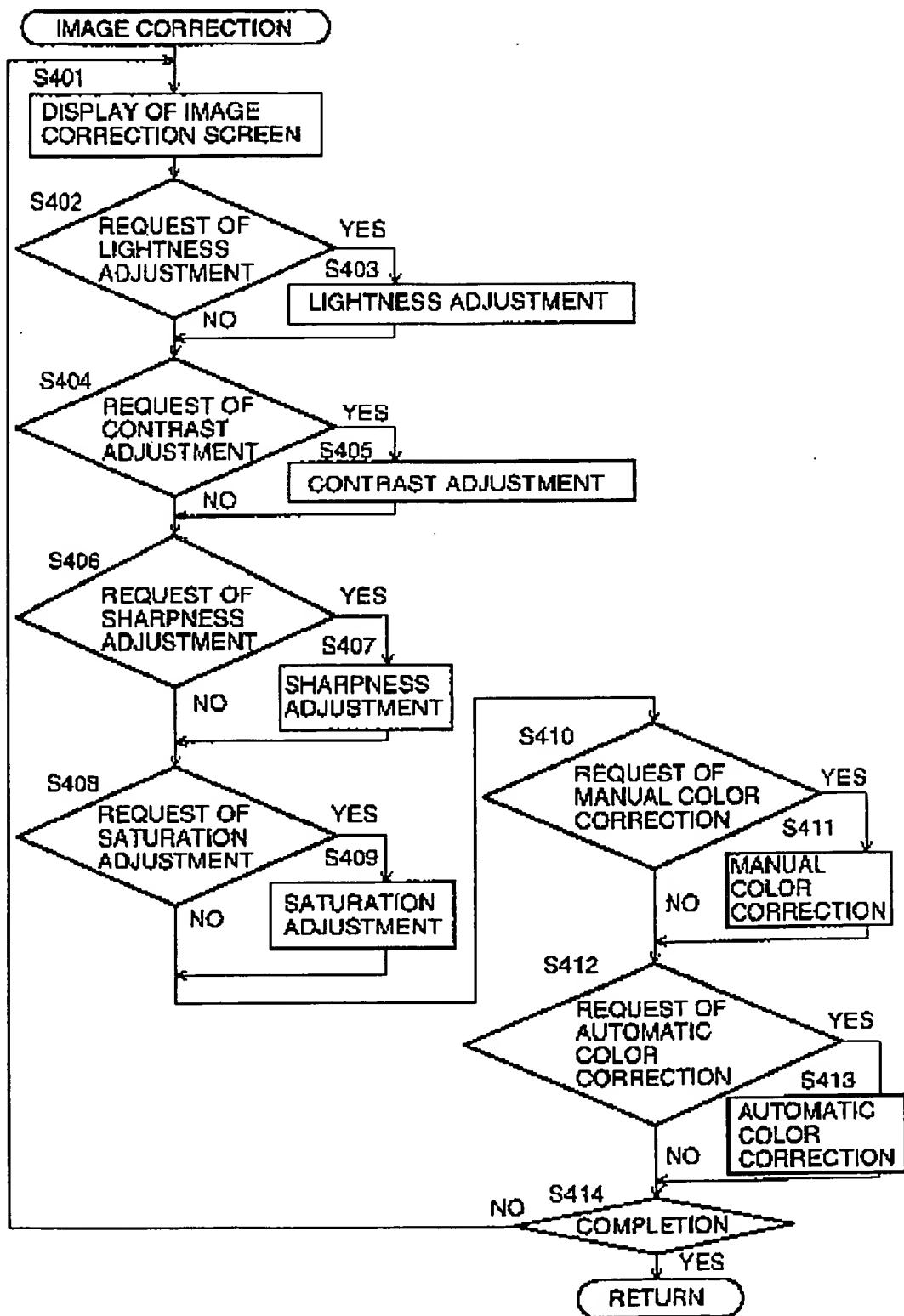
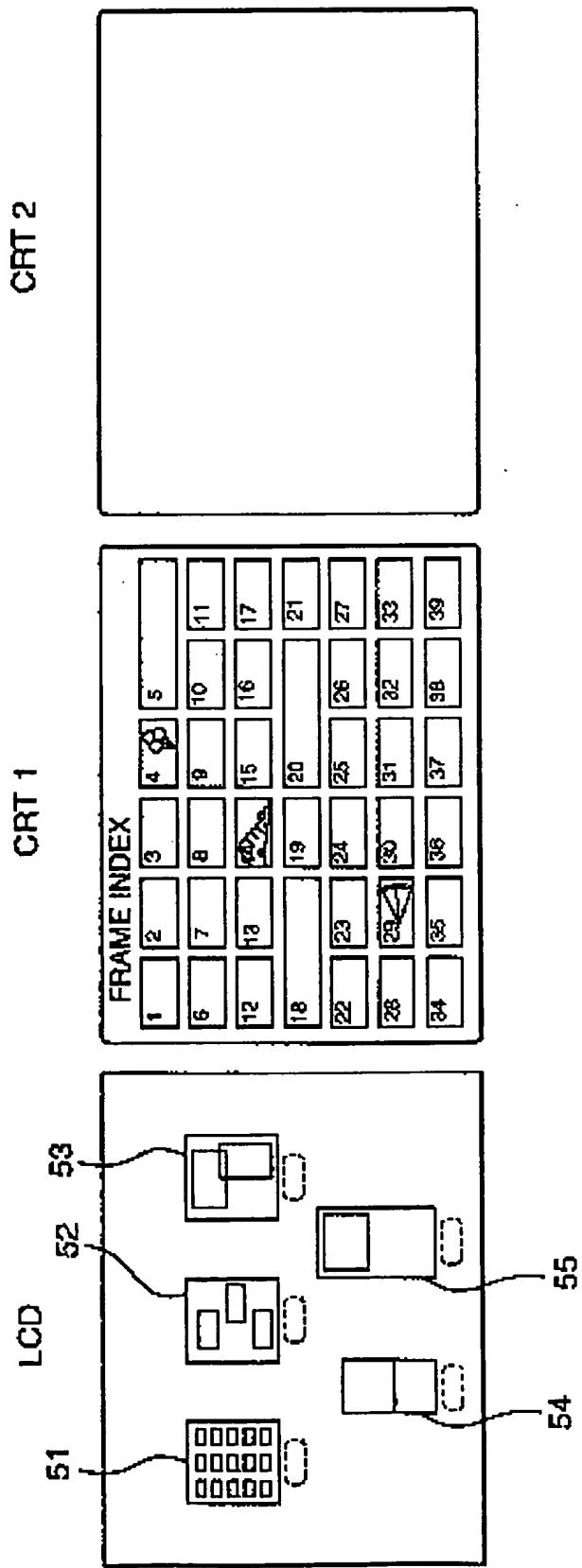


FIG. 25



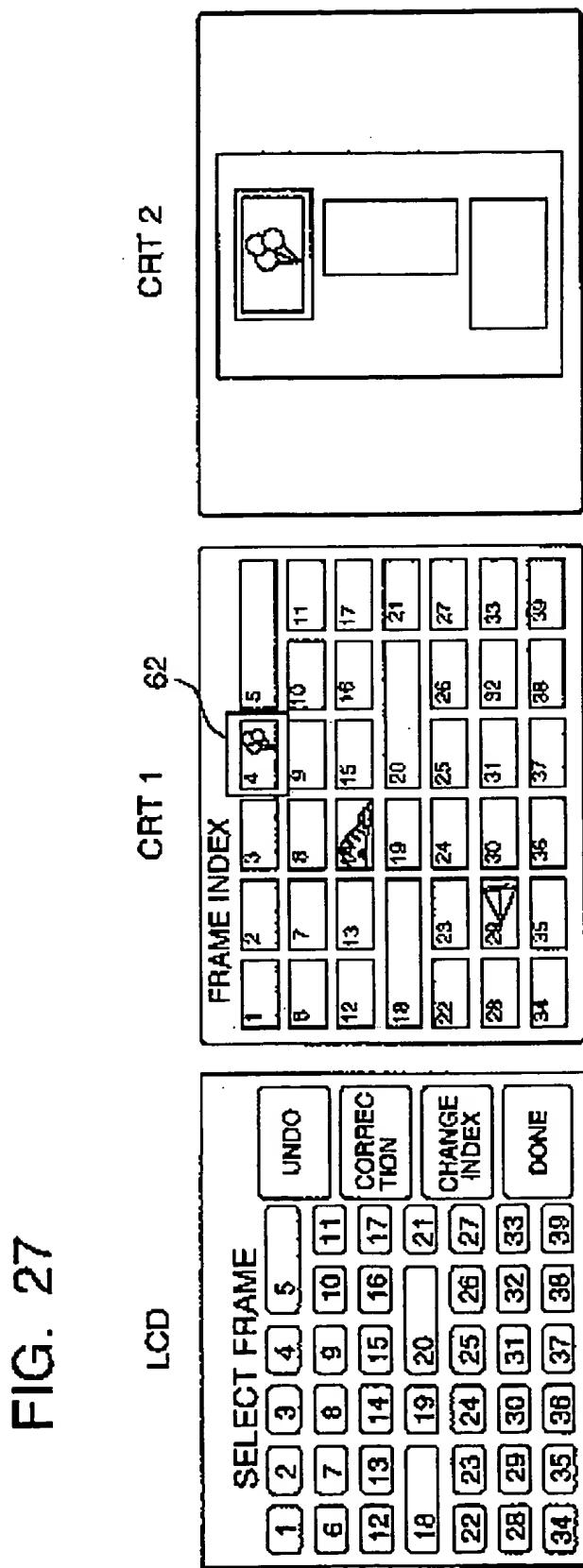


FIG. 27

FIG. 29

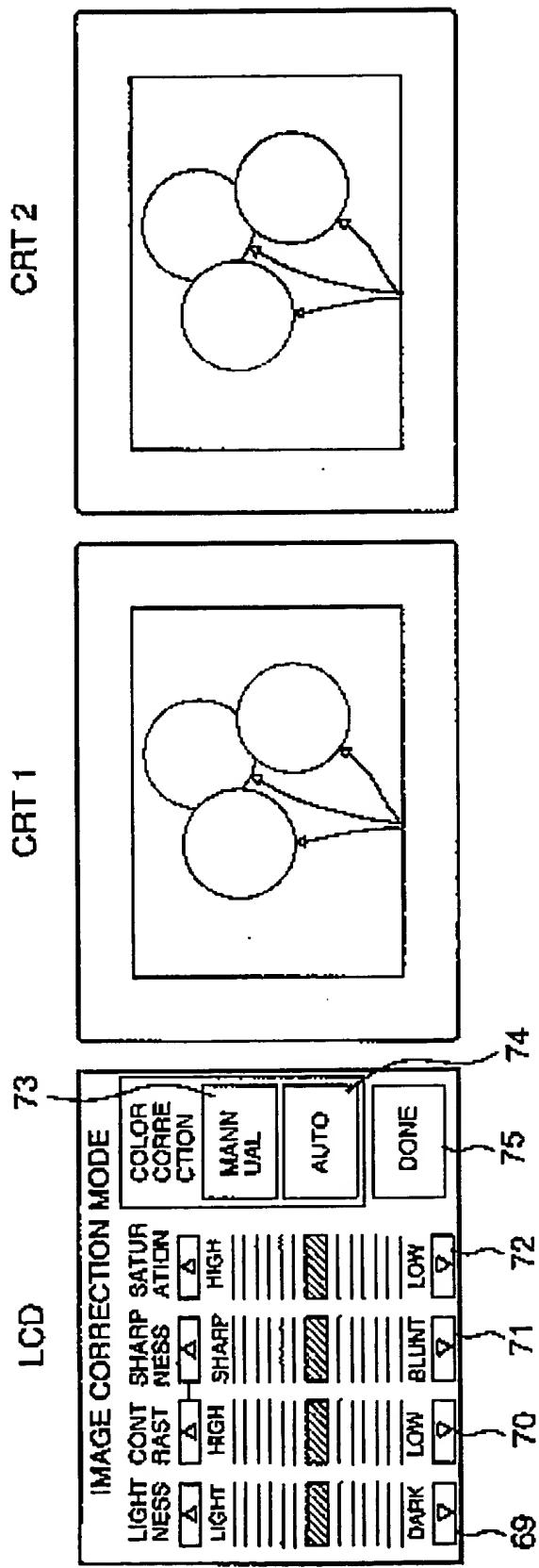


FIG. 31

